Appendix I

Work Risk Assessment

Project Risk Assessment

Document Control No.: *RA-04*	**Date Assessment Completed:** Updated 7/30/10	**Location:** Yerington Mine Site
Project Name: **Transite Pipe Removal Action**	**Project Description:** Transite pipe was used to transport process solutions to various parts of the site and is found in many areas including: process area, dump leach, sulfide tailings, evaporation ponds, and along roadways connecting these locations. Project requirement is to characterize all areas of pipe for asbestos content and radiological occurrence. Potential radiological containing materials (i.e. pipe with visible sediment or scale material inside) will be transported off-site for disposal, all other material will be removed from its current location and placed in an on-site landfill constructed for the purpose.	**Risk Assessment Leader:** Penny Bassett **Risk Assessment Team:** Roe Souther, Rich Mattucci **WRA Reviewed & Authorized to Proceed:** **SIMOPS:** ☑YES ☐NO **Designated PIC:** To be determined

Work Plan (List Project Steps) List the jobs required to complete the project scope in the sequence they are carried out.	Any tools or heavy equipment needed? If YES, What Type	Is this a SIMOP? If YES, Include in Mitigation Plan.	Do any of the *Golden Rules of Safety* apply? If YES, Which of the 8?	Which of the 8 energy or biological root sources could possibly be involved in this job?	**What** would be the result of exposure to a biological or energy source? (e.g., Bites, Slips, trips, falls, exposures, electrocution, injury, death, etc.); and **How, where, or when** could an uncontrolled release or unwanted contact with a biological or energy source occur? **Note:** Humans are biological sources, and their physical abilities, competency, and training should also be considered here.	Environmental Impacts Could there be a release to the air, soil or water, and or, will a waste be generated? If YES, What?	Pre-Mitigation Risk Evaluation: Frequency	Consequence	Likelihood	Risk Score	Permit(s) Required? If YES, What kind?	Energy / Biological / Waste Management Plan List control measures required to eliminate, control, or protect against unwanted contact with an uncontrolled biological or energy source to minimize the risk of injury or environmental Impact. **Hierarchy of Controls:** Elimination, Substitution, Isolation, Engineering/ Administrative, PPE	Who is responsible for Hazard Mitigation? Name or Title	Post-Mitigation Risk Evaluation: Frequency	Consequence	Likelihood	Risk Score
Observation 1. Occurance of asbestos containing materials (ACM) in the form of asbestos cement pipe (transite). Transite pipe is a know asbestos material; handling of asbestos materials requires use of workers trained and certified in asbestos. For the purpose of this work, all transite pipe and wrapped metal pipe is assumed to be ACM whether or not there is confirmatory sampling.				Chemical	**Chemical** - Worker exposure to regulated asbestos material or potential dispersal of asbestos fibers that could impact nearby residences or businesses. Exposure to asbesots fibers can result in asbestosis or cancer.	**Yes** Possible release of asbestos fibers to air or soil	Occasional Exposure	Very Serious Consequence	Unusual but possible	Substantial Risk		Project shall be managed by a licensed asbestos abatement consultant and/or certifed AHERA asbestos contractor/supervisor. Only trained asbestos technicians and contractors shall be used to sample, handle, move, and transport identified asbestos containing material (ACM). OSHA required asbestos handling procedures shall be followed (wetting of material, encapsulation, dust control, etc.) and the "BP Group Recommended Practice for Asbestos (GRP 3.4-0002)" should be followed.	AHERA asbestos supervisor	Occasional Exposure	Important Consequence	Remotely possible	Minimal Risk
Observation 2. Radiological materials may be present. Process solutions carried through these pipes may have been elevated in radiological compounds (uranium, radium) and may still be present in residuals left in the pipes.				Radiation	**Radiation** - Worker exposure to gamma radiological sources or inhalation of low-level alpha or beta radiological material. Exposure to radiological materials can result in cancer.	**Yes** Possible release of radiological materials to air or soil	Rare Exposure	Very Serious Consequence	Remotely possible	Minimal Risk		Handling of radiation contaminated materials shall be under the supervision of a Radiation Health Physicist. Radiological materials may need to be handled and disposed separately from unaffected transite pipe. An offsite licensed landfill may be required depending on radiation level. Workers working inside known radiation areas shall take additional precautions including wearing dosimeters, tyvek coveralls, respiratory protection.	Radiation Health Physicist	Rare Exposure	Serious Consequence	Remotely possible	Minimal Risk
1a. Preliminary characterization of material. Conduct a characterization survey that includes physical sample collection for asbestos and radiochem analysis and a real-time radiometric survey of alpha, beta, gamma radioactivity levels.	**No**	**No**	**No**	Motion Gravity Chemical Radiation Biological	**Motion/gravity** - Walking or driving to pipe location there is rough uneven terrain with tripping hazards, potential to fall from exposed highwalls that could result in twisted ankle, or serious injury. **Chemical** - Inhalation of asbestos fibers has long-term chronic health issues. **Radiation** - Sampling done in the radiological control area (RCA) will expose workers to low-level radiation hazards with inhalation and chronic health issues. **Biological** - Insects, spides, snakes could be encountered during the sampling could result in minor sting to a major health issue from snake bite.	**No**	Occasional Exposure	Serious Consequence	Unusual but possible	Low Risk	**No**	**Motion/gravity** - Do not attempt to sample material in unsafe locations (near exposed highwall, on steep slope). Work in teams so that no one works alone. Wear protective footwear with ankle support. **Chemical** - Half mask particulate respirator required for workers involved in disturbing or breaking suspected asbestos materials. **Radiation** - Workers entering the RCA shall wear Tyvek, half mask respirators, and dosimeter badges. Time in RCA should be limited to no more than an hour. **Biological** - Discuss biological hazards with workers and methods to limit risks such as gloves when reaching into restricted areas, avoid stepping into areas where you cannot see well.	Sample Technician	Occasional Exposure	Important Consequence	Conceivable but unlikely	Minimal Risk
1b. Characterization of scale material inside pipe. Collect scale samples from open ends of pipe where present and from areas of continuous runs of connected pipe where scale or sediment might occur. Open up sections of pipe by lifting with backhoe and spreader bar to loosen slip collar. Take radiation survey readings at all sample locations.	**Yes** Backhoe	**No**	**No**	Motion Gravity Chemical Radiation Biological	**Motion/gravity** - Walking or driving to pipe location there is rough uneven terrain with tripping hazards; motion of backhoe equipment could strike workers or could tip on uneven terrain; lifting motion of backhoe to open the pipe joints could cause sudden release or flying debris that could strike workers. **Chemical** - Inhalation of asbestos fibers has long-term chronic health issues. **Radiation** - Potential to encounter low-level radiological materials in pipe scale samples. **Biological** - Insects, spides, snakes could be encountered during the sampling could result in minor sting to a major health issue from snake bite.	**No**	Occasional Exposure	Very Serious Consequence	Unusual but possible	Substantial Risk	**No**	**Motion/gravity** - Follow safe lifting procedures to ensure equipment is capable of lifting the load; work on level terrain; keep ground workers at a safe distance. Work in teams so that no one works alone. Wear protective footwear with ankle support. **Chemical** - Half mask particulate respirator required for workers involved in disturbing or breaking suspected asbestos materials. Wet down area prior to sampling to minimize asbestos fibers. **Radiation** - Measure radiation levels at each sample site to ensure it is within safe working levels. **Biological** - Discuss biological hazards with workers and methods to limit risks such as gloves when reaching into restricted areas, avoid stepping into areas where you cannot see well.	Sample Technician	Occasional Exposure	Very Serious Consequence	Remotely possible	Low Risk
2. Construct landfill. Engineered landfill will be constructed on the south sulfide tailings for disposal of ACM pipe removed during this removal action. Total landfill disturbance area of ~300' x 150' with a depth of 8'. Dozer will push the tailings material to create excavated area, tailings will be stockpiled on sides to be reused for intermediate lift cover material, clean gravel will be imported to place on sloped entry/exit ramps, blade & roller may be used to smooth the driving surface. Landfill designed to meet requirements of Nevada Class III landfill but is not a NV permitted landfill.	**Yes** Dozer, blade, compaction roller	**Yes**	**Yes** Ground Disturbance	Motion Gravity Chemical	**Motion** - Motion of heavy equipment (forward or reverse movement) could strike workers. **Gravity** - Uneven ground surfaces and slope for entry/exit to the landfill. The excavation is of sufficient size, in open air and with safe access/egress at all points that it will not be considered a potential confined space. **Chemical** - The landfill will be constructing in mine sulfide waste with very fine grain size, inhalation of this material may irritate lungs and expose workers to elevated metals.	**No**	Continuous Exposure	Very Serious Consequence	Unusual but possible	Very High Risk	**Yes** Ground Disturbance	**Landfill has been designed by a professional engineer with wall slopes based on soil type and stability. Location in mine waste area rignificantly reduces the potential for encountering underground utilities, however, buried pipelines are still a small potential and will be evaluated using GPR detection methods. **Motion** - Establish restriced area around heavy equipment, keep workers and vehicle out unless equipment is stopped and operator is aware of presence. **Gravity** - Construct a protective berm around the top perimeter of landfill to keep workers and vehicles from unsafe areas. **Chemical** - Establish and air monitoring program and action levels to determine if respiratory protection may be required. Use dust mitigation techniques (e.g. water application) to control dust.	Landfill construction contractor project manager	Continuous Exposure	Serious Consequence	Remotely possible	Substantial Risk
3a. Remove transite pipe from location and place in staging area for loading to trucks. Use a forklift to pick up and transport pipe lengths to staging area. Evaluate pipe for presence of scale or sediment to determine disposal location, clean pipe interior (as needed) to remove loose scale/sediment using a brush or pig, apply ammended water, encapsulant (as needed) and bag/seal pipe ends (as needed) for transport. Metal pipe may need to be cut to pieces with welding torch.	**Yes** Forklift	**Yes**	**Yes** Lifting Operations	Motion Gravity Chemical Radiation Thermal	**Motion/Gravity** - Access to areas with steep slopes, highwalls etc. may place workers on foot at risk of fall from height and trips on uneven surfaces. Heavy equipment may be at risk of rolling over, collapse of unsupported walls due to weight loading. Old, rarely used roads may be unstable or unsuitable for use by heavy equipment. **Gravity/Lifting** - If pipe is lifted by method other than forklift (e.g. sling, backhoe, crane) it is possible the lift could be off-balanced, the pipe could swing uncontrolled, the weight could exceed the lifting capacity of the equipment used. **Chemical** - Workers handling RACM may be exposed to friable or airborne asbestos fibers which is a respiratory hazard. **Radiation** - Radiological materials may be encountered during the removal phase. **Thermal** - Potential burn, fire or eye injury from use of welding torch (or other cutting tool) to cut metal pipe to length.	**Yes** Release of asbestos fibers to air or soil	Continuous Exposure	Disastrous Consequence	Unusual but possible	Very High Risk	**Yes** Lifting Ground Disturbance Hot Work	**Motion/Gravity** - Develop a maximum distance allowed for workers or equipment to get to slopes or highwalls based on each areas specific conditions. Evaluate and repair/upgrade access roads as needed before using roads for moving pipe. Ground disturbance permit may be required for road improvements or for removal of pipe that is partially buried. **Gravity/Lifting** - Prepare an incidental lifting plan and lifting permit if required. Evaluate lift capactiy, center of gravity, swing potential or other lifting issues before beginning. **Chemical** - Only certified asbestos workers can handle pipe. Broken or potentially friable ends of pipe shall be sprayed with encapsulant before handling. Broken shards shall be put in plastic bags. Workers should wear tyvek and respirators. **Radiation** - A radiation health physisist (or other trained person) shall completed a field radiometric survey of each piece of pipe, either before it is picked up or after it has been placed in the staging area. Pipe that exceeds the ARAR shall be segregated and handled as mixed TENORM waste at a later time. **Thermal** - Use hot work permit system when cutting metal pipe, wear welders face shield and gloves.	Abatement contractor project manager	Continuous Exposure	Serious Consequence	Remotely possible	Substantial Risk
3b. Transport transite pipe to onsite landfill Load pipe into truck and transport to on-site landfill. Unload at landfill.	**Yes** Forklift, haul truck, dozer or thumb excavator	**Yes**	**Yes** Driving Safety	Motion Gravity Chemical	**Motion** - If there is more than usual traffic on mine roads (including other SIMOP activities) there is greater risk of collision. Trucks may work in tight areas where they have limited maneuverability and potential to drive off a road or strike an obstacle. Potential for material to fall from forklift during loading of truck, could strike truck and cause property damage or could strike workers on ground nearby. **Gravity** - Improperly secured loads could come loose or break the asbestos pipe potentially releasing fibers. Some removal areas are on sloped areas, potential for unstable lifting. **Chemical** - Improperly encapsulated ACM could release fibers across a wide area during transport, could expose workers to asbestos or could allow asbestos to drift off-site to residential or commercial areas.	**Yes** Release of asbestos fibers to air or soil	Continuous Exposure	Serious Consequence	Unusual but possible	High Risk	**No**	**Motion** - A traffic control plan should be developed to identify staging areas, one-way roads, areas of cross-traffic. Workers should not exit vehicles while being loaded or unloaded. **Gravity** - Loads should be inspected to ensure they are secure before travel. **Chemical** - Encapsulant should be used on broken ends, may need to consider use of tarp over top of load to contain fibers during transport. Conduct and "initial exposure assessment" to identify potential asbestos concerns. Develop an air monitoring plan that may include a "negative exposure assessment" completed by a CIH.	Abatement contractor project manager	Continuous Exposure	Important Consequence	Remotely possible	Low Risk

Project Risk Assessment

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							Frequency	Consequence	Likelihood	Risk Score					Frequency	Consequence	Likelihood	Risk Score
3c. Transport transite pipe with scale/sediment to rad waste staging area near process area surge pond. Construct dirt/gravel pad for staging area to place pipe that will be shipped offsite to US Ecology Grand View, ID waste facility that accepts low-level TENORM waste. Load selected pipe into truck for temporary holding in this staging area.	**Yes** Dozer, blade, forklift, truck	**Yes**	**Yes** Driving Safety	Motion Radiation	**Similar hazards as step 3b plus hazards identified below:** **Motion** - Construction of pad by importing dirt or gravel, potential to strike something with heavy equipment, working in area with potential traffic for other work activity (SIMOP) **Radiation** - This pipe is designated as potential radiological hazard but none is expected to be at levels that are a potential health risk with the exception of material removed from the Radiological Control Area (RCA)	**Yes** Release of asbestos fibers or radiological materials to air or soil	Continuous Exposure	Serious Consequence	Unusual but possible	High Risk	**No**	**Same as Step 3b.** **Motion** - Develop a SIMOP plan that manages the potential conflict with other work happening in area of rad pipe stockpile area. **Radiation** - Work done inside the RCA must be done under the supervision of a radiation health physicist with additional radiation monitoring and decon procedures (workers should wear dosimeter badges, equipment should be deconned and frisked when complete).	Abatement contractor project manager	Continuous Exposure	Important Consequence	Remotely possible	Low Risk
3d. Loading and highway transport of rad pipe waste along with rad soil waste from other process area soil removal action project. Load highway transport trucks with rad transite pipe waste and rad soil waste from the staging areas in and near the process area surge pond.	**Yes** forklift or thumb excavator, highway haul trucks	**Yes**	**Yes** Driving Safety	Motion	**Similar hazards as step 3b plus hazards identified below:** **Motion** - Highway driving for long distances, potential for collosion, loss of control, driver fatigue or driver distractions.	**Yes** Release of asbestos fibers or radiological materials to air or soil	Continuous Exposure	Very Serious Consequence	Unusual but possible	Very High Risk	**No**	**Same as Step 3b.** **Motion** - Driving is expected to be contracted to the waste management company, therefore managing driver safety will be their responsibility.	US Ecology	Continuous Exposure	Important Consequence	Remotely possible	Low Risk
4. Final closure of completed landfill. When removal action is complete, the landfill will be backfilled to grade and marked with signs.	**Yes** Dozer	**Yes**	**No**	Motion Chemical	**Motion** - Movement of heavy equipment could strike a person or obstacle; operator could be injured from vibration (back injury); operators could be injured getting in and out of equipment. **Chemical** - Inhalation hazard from sulfide tailings dust.	sulfide tailings dust released to air and potentially off-site	Rare Exposure	Serious Consequence	Unusual but possible	Low Risk	**No**	**Motion** - Maintain restriced zone around working equipment to keep people from entering while equipment is in motion; train operators in the hazards of vibration and how it can cause ergonomic injuries and the need to take frequent breaks; train operators to use 3-point contact when getting in/out of equipment to prevent falls or injuries from jumping to ground level. **Chemical** - Conduct air monitoring; respiratory protection may be required based on previous testing. Use dust control procedures.	Landfill construction contractor project manager	Rare Exposure	Important Consequence	Remotely possible	Minimal Risk